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Interprofessional collaboration and on-the-job training improves access to HIV testing, HIV primary care and Pre-Exposure Prophylaxis (PrEP)

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Abstract

The HIV Continuum of Care is a global priority, yet vulnerable patients face access/retention challenges. Research is missing on the role social and public health service providers can play to help these patients. Using structural equation modeling, we examined the effects of interprofessional collaboration (IPC) and on-the-job training on the frequency of linkages to HIV testing, HIV primary care, and on Pre-Exposure Prophylaxis (PrEP) psychoeducation. Sample included 285 New York City providers of social and public health services – in 34 agencies. Forty-eight percent of providers had not offered PrEP psychoeducation and linked fewer than five patients to HIV testing and primary care per week. However, in multivariate analysis higher IPC was associated with more linkages and frequent psychoeducation. After adjusting for IPC, linkage training was associated with more frequent services. The influence of specific factors highlights areas for interventions and policies to improve access to the HIV Continuum of Care.

Keywords

Interprofessional Collaboration; HIV testing; HIV primary care; PrEP; care continuum; linkages to care

Global efforts to prevent HIV transmission prioritize engagement of people living with HIV into the HIV Continuum of Care “care continuum,” sometimes referred to as the HIV treatment cascade. The care continuum is a sequence of five steps that (1) helps at-risk

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individuals find out their HIV status through testing; (2) links those who test positive to HIV primary care and provides those who test negative with pre-exposure prophylaxis (PrEP), a daily oral antiretroviral therapy (ART) that decreases their likelihood of acquiring HIV; (3) helps those who test positive stay in care, (4) providing them with ART, which results in (5) HIV viral suppression (Thompson et al., 2012; United States Health Resources & Service Administration, 2016). Epidemiologically, the care continuum represents a constant movement of patients – entering, re-entering, and exiting care (Gill & Krentz, 2009). Social and public health services providers ("providers") – i.e., social workers, health educators, care navigators, etc. – all have a great influence on the care continuum. Such providers, working in HIV primary care, outpatient and prevention settings, are responsible for offering psychoeducation on ART, and for linking at-risk patients to medical personnel licensed to perform HIV testing, deliver HIV primary care, and prescribe ART (Cook, Lutz, Young, Hall, & Stacciarini, 2015; Philbin et al., 2016; Sullivan et al., 2015).

This study used a sample of 285 providers in 34 New York City social service agencies, in order to assess the direct effects of interprofessional collaboration (IPC) and training on: individual providers' tendencies to make linkages to HIV testing and HIV primary care; and on PrEP psychoeducation to help patients access ART. Participating providers were not physicians licensed to prescribe PrEP; however, all were qualified to deliver PrEP psychoeducation, which empowers patients with information about ART and encourages them to seek prescriptions from physicians. By partnering with organizations and service providers in communities suffering health disparities and social inequities, we sought to provide a unique snapshot of how HIV continuum of care services are being provided in a large diffusion system. In so doing, we found implications for service implementation in other systems nationally and globally. This study advances implementation science and advances social justice by generating findings with the potential to narrow health disparities.

Linking patients to the HIV Continuum of care

Personal and environmental factors preclude vulnerable individuals from accessing the care continuum and may lead to health disparities. Patients experiencing stigma, or those who distrust health professionals or who lack information about the care continuum, are more likely to delay or forgo entirely engagement in the care continuum (Cook et al., 2015; Philbin et al., 2016). Individuals who are linked to the continuum may still encounter barriers, such as inadequate health insurance, difficulty accessing medical personnel, and poor transportation to care settings (Aziz & Smith, 2011; Bauman et al., 2013; Dombrowski, Simoni, Katz, & Golden, 2015). Research on access, uptake, and adherence to PrEP shows that often medical personnel either lack awareness of ART or are unwilling to prescribe it to *uninfected* patients (Krakower, Ware, Mitty, Maloney, & Mayer, 2014; Petroll et al., 2017). Research also shows unfavorable patient attitudes (e.g., side effects) toward PrEP (Liu et al., 2008). Engagement and retention in ART can be further frustrated by patients' psychosocial issues, such as depression, substance use, and poverty (Bhatia, Hartman, Kallen, Graham, & Giordano, 2011; Del Rio & Mayer, 2013; Moore, 2011). Nonetheless, patients' access to and retention in the care continuum can be improved by providers who, in their day-to-day practices, have the ability to link patients to care continuum services, offer PrEP psychoeducation, and also offer emotional and cognitive support, care coordination, and

mental health and concrete support services, all of which can encourage engagement and improve patient retention (Calabrese et al., 2016; Cook et al., 2015; Philbin et al., 2016; Sullivan et al., 2015; Underhill et al., 2014). Myriad factors may influence linkage to care continuum services, and much research is needed on collaboration across service agencies and on innovative uses of existing resources to develop both the science and practice of engagement in the care continuum (Christopoulos, Das, & Colfax, 2011; Mugavero, Amico, Horn, & Thompson, 2013; Mugavero, Norton, & Saag, 2011; Zaller, Fu, Nunn, & Beckwith, 2011).

Conceptual Framework

Factors that influence linkages to care continuum services can be found at multiple socioecological levels. Therefore, this study is guided by Mugavero et al.'s socioecological perspective suggesting that factors in four domains of reference may influence linkage-making: Individual (provider), Relationships (interprofessional), Community (agency settings), and Policy (best practices) (Mugavero et al., 2013). The Individual domain comprises predisposing and enabling factors, such as provider demographics and knowledge base. The Relationships domain includes interpersonal characteristics, such as IPC practices. The Community domain comprises agency setting factors, including size and capacity. The Policy domain contains regulations and guidelines for HIV services. This socioecological perspective guided our choice of key variables described below and depicted in Figure 1. Furthermore, Mugavero et al.'s socioecological perspective is complemented by behavioral theories suggesting that key cognitive constructs, such as knowledge/training, opinions and attitudes may influence how frequently providers may engage in linkage-making behavior (Michie et al., 2005; Perkins et al., 2007). Grounded in these concepts, we hypothesize that providers' linkage-making behaviors will be influenced by their knowledge (HIV- and linkage-related training) and their opinions and attitudes toward IPC – both these concepts are discussed below.

The role of Interprofessional Collaboration (IPC) and Provider Training in linkages

IPC refers to when providers from different disciplines and job roles, working in myriad service settings, exchange knowledge and resources in order to help patients find needed services (Bridges, Davidson, Soule Odegard, Maki, & Tomkowiak, 2011; Garland & Brookman-Frazee, 2015). IPC enhances providers' abilities to offer a coordinated and full continuum of care (Hoberecht, Joseph, Spencer, & Southern, 2011; Popp, MacKean, Casebeer, Milward, & Lindstrom, 2014; Provan & Lemaire, 2012). Evidence suggests that strong professional relationships among providers can increase the efficiency of patient services and improve coordination among different types of providers (Carey et al., 2015). Most patients go through a crisis period following their HIV diagnosis. In order to help these patients cope and stay in care, increased communication (i.e., IPC) is recommended, for example, between a patient navigator linking a patient to a HIV primary care physician (Cook et al., 2015). Thus linkage-making may be improved by employing community-based care navigators and by communication among providers with different job titles and roles

(Kinsky et al., 2015). Further, psychoeducation on ART appears to improve overall access and reduction in barriers to care continuum (Sullivan et al., 2015). Grounded in qualitative data, the literature suggests best practices; e.g., networking among service settings and using a team approach for linking patients to myriad services (Bauman et al., 2013; Kim et al., 2014). Missing is predictive research showing the role of measurable factors, such as IPC, that influence linkage-making specific to HIV care continuum services.

The literature shows that interventions to address barriers to care, including case management, co-location of services, and outreach to hard-to-reach patients, requires multiple interactions between service providers and patients (Krakower et al., 2014; Ma, Chambers, Jenkins Hall, Tanner, & Piper, 2017; Zaller et al., 2011). For example, linkage to care is improved when linkage programs are led by frontline providers and their supervisors by using outreach strategies (Gilman, Hidalgo, Thomas, Au, & Hargreaves, 2012; Kinsky et al., 2015). On-the-job training in different aspects of HIV prevention and care can help to reduce costs while making linkages more unique and flexible (Gilman et al., 2012; Kinsky et al., 2015). Research also suggests that caseload, job satisfaction, agency size (e.g., budget) and capacity (e.g., staff size) may influence linkages to the care continuum (Bauman et al., 2013; Mugavero et al., 2011; Tomori et al., 2014). Regrettably, less is known about the specific role of IPC in HIV prevention and care. Nonetheless, IPC is a widely known and reliably measured concept shown to improve patient outcomes in different areas of research and practice, such as primary care, internal medicine, chronic care, nursing, dentistry, palliative and hospice care, pain management, and others (Bookey-Bassett, Markle-Reid, McKey, & Akhtar-Danesh, 2016; Havyer et al., 2014; Tomizawa, Shigeta, & Reeves, 2017). Though underdeveloped, the literature on IPC in the fields of HIV prevention and care supports IPC for its potential to enhance access and retention in HIV services (Chetty & Maharaj, 2013; Doriccah Peu et al., 2014; Olivier & Dykeman, 2003).

The care continuum is collaborative in nature and requires dynamic, multi-systemic IPC among providers trained to perform linkages to care continuum services. The collaborative work across service settings (i.e., diffusion systems) is vital for successful care continuum implementation and future HIV prevention(Purcell, McCray, & Mermin, 2016). This paper uses structural equation modeling to examine the effects of IPC and provider training on linkages to care continuum services across a diffusion system of 34 agencies in NYC. We thus provide an empirically-based model, including pathways that may improve entry and retention in care for people living with HIV, and suggest key target variables upon which we can intervene and train providers to improve their own engagement in the care continuum by more frequently providing linkages to services and psychoeducation on PrEP.

METHODS

Overview

Data for the current study came from an NIMH-funded (R01MH095676) longitudinal project, Implementation Collaboration for Implementation (“Project ICI”). Project ICI examines providers’ implementation of HIV services in primary care, outpatient treatment, and prevention programs in NYC. Project ICI was conceived and conducted in partnership with stakeholders, from establishing study aims to developing and piloting survey questions

to collecting and analyzing data, and was approved by the Institutional Review Boards at Columbia University and at the University of Michigan (Pinto, Spector, Rahman, & Gastolomendo, 2013; Pinto, Spector, & Valera, 2011). Project ICI collected survey data on 379 providers in 36 agencies in 2013–14. Twelve months later, 293 providers (77% retention rate) completed a similar survey with expanded questions, used in the current study, about provider services (e.g. PrEP psychoeducation). Two pairs of agencies had merged between baseline and 12-months follow-up resulting 34 agencies. Most loss-to-follow-up was due to high job loss. Eight participants were excluded because they were no longer a service provider, resulting in n=285 providers with survey data reflecting 34 agencies for the current study.

Procedures

Recruitment—We used a convenience sample, selected based on characteristics of a population of service providers and the agencies for which they work, as follows.

Agency recruitment.: Agencies funded by the NYC Department of Health and/or the CDC to provide HIV-related services. We recruited from a list provided by the NYC Department of Health and the CDC of over 100 agencies. Study staff contacted agency representatives by phone and outlined study procedures and staff inclusion criteria. Nine agencies were in Manhattan, eight in Brooklyn, four in Queens, three in the Bronx, and nine had sites in two or more boroughs. Agencies received a computer (valued at $1,000) as an incentive to participate.

Provider recruitment.: To be included, a provider (social worker, health educators, patient navigators and others) had to be able to make linkages to care continuum services. There were no exclusion criteria. The average number of providers per agency was 10 (2 to 25), representing from 10% of all providers in large agencies to 100% in small agencies. Providers received $20 gift cards upon completion of confidential interviews.

Data collection.: Project staff implemented computer-assisted face-to-face interviews. We used notebook computers loaded with password-protected survey software powered by DATSTAT Illume 6.0. All data were stored in computers to which only relevant personnel had access. Providers read and signed informed consent prior to interviews that lasted 45–60 minutes. Agency leaders also took a short Organizational Survey about agency characteristics, such as size and capacity (15–20 minutes). The Organizational Survey included questions about organizational size and capacity. The Provider Survey included questions on demographics, opinions about IPC, training capacities, and linkage behavior.

Measures

Outcome: “Care continuum engagement” is operationalized as the number of linkages providers make to the first key steps of the care continuum (HIV testing and HIV primary care) plus PrEP psychoeducation. We used three questions: “How many patients did you link to *HIV testing* within the past six months?” and “How many patients did you link to *primary care*?” Responses: more than 20 patients; 16–20; 11–15; 5–10; fewer than five. These responses were defined in collaboration with ICCB providers, based on how providers

typically talk about and record referrals. Based on feedback from providers, these measures were developed assuming that, in their day-to-day practice, providers use myriad strategies for linking patients. Our data show that 87% of providers tracked linkages through a tracking system, and linked patients by escorting them to the appointment, by asking patients to call for an appointment while they are still in the provider's office, and by calling themselves for the patients while they are still in the office, and by calling after patients leave the office. Only 13% of providers did not use these strategies or use a tracking system.

For *Post-exposure prophylaxis* (*PrEP*), we asked: In the past six months, how often have you educated patients about PrEP? Responses: several times per week; about once per week; about once per month; less than once per month; have not educated in past six months. This question was followed by an abbreviated definition of PrEP from the CDC website: "PrEP is a new FDA-approved medication for the prevention of HIV. People who do not have HIV can take a daily pill to reduce their risk of becoming infected." "Education" is thus conceptualized as the provider sharing with the patient, at a minimum, the abbreviated definition.

Predictors

Interprofessional Collaboration (IPC).—IPC refers to professionals within one's own agency and also in other agencies providing HIV-related services in the NYC diffusion system. We used the Bronstein IPC Index, a 49-item scale containing five domains measuring providers' opinions (strongly agree to strongly disagree) regarding IPC: *interdependence* (e.g., "I ask colleagues in other agencies for their expertise"); *newly created professional activities* (e.g., "New programs emerge from collaboration between colleagues from different agencies"); *flexibility* (e.g., "I am willing to take on tasks outside of my job description, when I think it is important"); *collective ownership of goals* (e.g., "My colleagues from other agencies work with me in an effort to resolve conflicts"); and *reflection on process* (e.g., "Colleagues from agencies in my network share information with consumers and students") (Scale Cronbach alpha = 0.84) (Bronstein, 2002). *Interdependence* refers to interactions between providers, involving referral-making, link-making, and consultations. *Professional activities* involve developing programs and changing agency structures to facilitate service delivery. *Flexibility* refers to providers' ability to perform different roles regardless of job title or description. *Collective ownership of goals* refers to providers coming together to pursue service goals, for instance, a patient navigator and a mental-health worker can help a patient and his/her partner to develop a care plan after receiving an HIV diagnosis. *Reflection on process* refers to when a provider integrates feedback from another provider to strengthen their collaboration. These five domains were taken as indicators of a single latent variable representing IPC in the structural equation modeling.

Linkage training.—We asked, "When were providers in your agency trained to help patients access HIV testing and primary care?" Responses included temporally, "never," "more than two years ago," and "within the past two years."

Covariates

Job context.— *Work positions* were categorized as supervisors and program administrators versus direct service staff (case managers, navigators, outreach educators) as participation in the care continuum differs between supervisors whose job may include linkage-making but not as a main responsibility and direct service staff whose jobs *require* linkage-making. *Caseload* was measured with the question, “Please tell us, on average, how many patients you provide services to each week (individually or in groups)? Responses included, <30, 31–50, and >50. *Job satisfaction* was measured with three questions: “How satisfied are you with your (1) job, (2) pay, and (3) working conditions? Responses: “I am completely dissatisfied” to “I am completely satisfied.”

Demographics.— *Age* was measured in years. *Ethnicity* included Latino/Hispanic or non-Latino/Hispanic. *Race* included White, African American, “more than one race,” and a grouping of Asian, Native Hawaiian, Alaskan Native, and American Indian. *Gender* was categorized as male or female. *Education* included high school, associate’s degree, bachelor’s degree(s), master’s degree(s), and PhD(s). The education variable (Less than HS, HS diploma, Associate’s, Bachelor’s, Master’s, Doctoral) was dichotomized into Associate’s or higher vs. HS or less for predictive analysis. *Licensure* was measured by providing a list (alcohol/drug counselor, nurse, physician, psychologist, mental health counselor, social worker) where participants could check all that applied. This variable was dichotomized into participants with at least one license and those without licenses. *HIV knowledge*, “Do you have formal (college or certificate) curriculum-based training in HIV prevention” (yes/no).

Agency size and capacity.—Agency-level data were collected at 12-months and linked to each provider. We used small to large budgets (< $1M; $1M-$5M; $5M-$10M; and > $10M) as proxy to agency size and number of staff (<25; 26–50; 51–100; and >100) as proxy to capacity. Among the providers followed at 12-months, there were 32 who had changed employment to different service agencies not included in the original agencies recruited at baseline but continued to provide HIV services in their new agency. For analyses, the agency size and capacity for these providers was categorized as “unknown”.

Data analysis

Descriptive summaries of agency and provider characteristics and frequencies of each outcome are provided. A structural equation model (SEM) was used to test the associations in the proposed model (Figure 1), using Mplus Version 7 software. (Muthén & Muthén, 2009) The default estimator for the analysis was the variance-adjusted weighted least squares (WLSMV), a robust estimator appropriate for ordered categorical and dichotomous observed variables such as the ones used in this study. IPC was measured as a latent variable composed of five measured continuous subscales. The primary outcome, Care continuum engagement, was measured as a latent variable composed of three ordered categorical variables described above. Demographics, job context, and agency size/capacity were covariates in the overall model.

The magnitude and significance of relationships in the model were examined by estimating and testing standardized path coefficients. Model fit was assessed using the root-mean-square error of approximations (RMSEA), the Comparative Fit Index (CFI), and the Tucker Lewis Index (TLI). CFI and TLI values greater than 0.95 and values of RMSEA less than 0.06 are commonly used to indicate good model fit and were used as cutoffs. To additionally assess whether there were any specific associations (i.e. direct paths) between the five domains of IPC and any of the three types of services in the care continuum, above and beyond the associations already captured by the latent variables, we also examined modification indices (i.e. chi-square test with one degree of freedom). To avoid including direct associations that could be significant because of multiple testing, we considered significant direct effects with modification index greater than 10 corresponding to $p<.003$. We decided a priori to evaluate statistical significance using a two-sided design with alpha set at 0.05.

RESULTS

Agency and provider samples

All 34 agencies were nonprofit organizations; 4 (11%) had budgets below 1 million; 16 (47%) between 1 and 10 million; and 14 (41%) above 10 million. Twelve (35%) agencies employed fewer than 25 providers; 14 (41%) between 25–100; and 8 (24%) more than 100 providers.

Table 1 summarizes provider demographics and work position. The average age was 43 [standard deviation (SD) = 12]. Most participants were females (63%); Black or African American (54%); and held a Bachelor's degree or higher (66%). Providers identified as supervisors/program administrators (38%) or direct service staff (62%). More than half (57%) did not hold a professional license. Sixty-one percent of providers have received formal training in HIV prevention. Other aspects of job context included 16% of providers offering services to more than 50 patients per week, while 58% fewer than 30 patients per week. The majority felt satisfied with their job (90%), their pay (66%) and working conditions (86%).

Sixty-one percent of providers reported receiving curriculum-based HIV prevention. Thirty-three percent reported recent (during the past year) in-agency linkage training to help patients access HIV testing and HIV primary care; 13% reported never having linkage training; and 54% received training more than one year to the time they provided data.

Care continuum engagement descriptive data

HIV testing.: In the prior six months, 24% of providers had linked more than 20 patients; whereas, 19% and 31% had linked none or fewer than five patients, respectively. Fifteen percent linked 5–10 patients; 5% linked 11–15; and another 5% linked 16–20.

HIV Primary care.: In the prior six months, 18% linked more than 20 patients; whereas, 19% and 29% of providers had linked none or fewer than five patients, respectively. Twenty-four percent linked 5–10 patients; 5% linked 11–15; and another 6% linked 16–20.

PrEP psychoeducation.: In the prior six months, 17% had provided PrEP psychoeducation several times per week; but 48% had not provided PrEP psychoeducation. Fourteen-percent had educated fewer than once per month; 11% about once per month; and another 11% once per week.

Structural Equation Model—The structural equation model results with standardized parameter estimates are displayed in Figure 1. Model fit statistics suggest overall good model fit, RMSEA = 0.03, 90% CI = 0.005, 0.04; CFI = .96, TLI = .94. All five observed subscales had significant factor loadings of at least 0.7 onto the IPC latent factor. High factor loadings show support that each subscale empirically reflects the IPC latent factor. For the Care continuum engagement latent factor, the factor loadings for the items describing HIV testing and primary care were also significant, and over 0.7 (0.91 and 0.86 respectively), and the loading for the item describing PreP was somewhat lower at 0.55.

After adjusting for linkage training, as well as covariates (demographics, job context, and agency characteristics), higher IPC was significantly associated with higher levels of provider engagement in the care continuum ($b = 0.21$, $p < .001$) – specifically higher frequencies of linkages to HIV testing and HIV primary care, and PrEP psychoeducation. Additional tests of modification indices indicated that no specific domain of IPC was more strongly related to any of the three outcome services. After adjusting for IPC, more recent linkage training ($b = 0.25$, $p < .001$) was significantly associated with higher levels of provider engagement.

Compared to those in small agencies (less than $1M budget), providers in agencies with mid-size budgets ($1M-$5M) were negatively ($b = -0.37$, $p = .03$) related to IPC; providers with curriculum-based HIV prevention knowledge had higher IPC scores ($b = 0.13$, $p = .048$) than providers without HIV knowledge; and those who identified as supervisors/administrators had higher ($b = 0.20$, $p = .003$) IPC scores compared to direct service staff (Supplemental Table 1).

DISCUSSION

Prevailing descriptions of the care continuum focus on individual patients and often fail to consider the instrumental role of social and public health providers in helping patients to access and stay in care. The HIV prevention and treatment fields are missing key questions related to organizational and provider level factors that may improve access and retention, and ultimately decrease HIV transmission and infection. Findings show that providers are actively engaged in linkage-making; however, it needs improvement – in the six months prior to this study, nearly half (48%) of providers had not offered PrEP psychoeducation and linked fewer than five patients to HIV testing and HIV primary care per week. Nonetheless, in the multivariate analysis, IPC and recent linkage training were associated with higher care continuum engagement – higher rates to HIV testing and HIV primary care linkages and more frequent PrEP psychoeducation. Reflecting the socioecological perspective guiding this study, the influence of these specific factors improving engagement highlight areas for potential interventions and/or policies to strengthen linkage-making behaviors needed to ensure success of the HIV Continuum of Care. Without HIV testing and HIV primary care

as first steps, one cannot get to the end of the continuum. For patients at-risk for infection, but whose HIV tests turn negative, PrEP can be a lifesaving strategy.

Although no dimension of IPC stood out above the others, findings raise important questions to pursue in future research. For example, how much *flexibility/interdependence* is there among providers from one agency to link patients to services provided at another agency? Role flexibility and interdependence (relying on colleagues) often generates referrals, consultations, or revised care plans (Katon et al., 2010). However, in a recent publication, the Project ICI team showed that a competitive environment and a fear of losing patients to other agencies may inhibit providers from engaging in linkage-making (Pinto, Witte, Filippone, Baird, & Whitman, 2017). This fear may also inhibit providers from sharing *collective ownership of goals*, for example, a provider who links a patient to HIV testing may never communicate with primary care personnel to identify needs resulting from HIV diagnosis. Similarly, competition for funds may inhibit providers from *creating new programs and services* and from *reflecting on process* (integrating feedback from another provider) in order to pool resources to support patients with myriad needs.

Providers who identified as supervisors/administrators and providers who have HIV knowledge had higher IPC scores. Because providers have different educational experiences prior to employment in a particular agency, HIV knowledge is expected to be uneven across providers with different levels of education in different work positions. Though uneven, curriculum-based HIV prevention education usually stresses concepts of collaboration among providers which could help explain this finding; further research is needed to tease out specific content of HIV education associated IPC. By virtue of their higher status, supervisors often arrange several linkages at the same time to agencies with medical personnel who can perform HIV testing and provide primary care. Additionally, our findings may be influenced by other factors, which should be pursued in future research. For example, one can be an excellent therapist but not good at linking to care. Linkage and referral typically fall under case management tasks and some providers may either not have skill at doing so or experience this task as not part of their job description. They may believe that their role is simply to provide clinical or therapeutic intervention on site while a navigator or supervisor perceive linkage-making as their key job responsivity.

Compared to small agencies (less than $1M budget), providers in mid-size agencies had lower IPC scores. More research is needed to assess the full importance of agency size; nonetheless, larger size may indicate that there are fewer opportunities for providers to communicate with colleagues in their network of agencies. While some responsibilities are mandatory, e.g. systems of tracking and monitoring, IPC reflects personal opinions providers have about their professional relationships at other agencies, and these need to be further explored (Spector & Remien, 2015).

Access and retention in the care continuum has not been optimal due to myriad factors faced by patients – stigma, distrust of health professionals, depression, substance use, poverty, difficulty accessing medical personnel, and medical personnel's unwillingness to prescribe ART to uninfected patients (Aziz & Smith, 2011; Bauman et al., 2013; Cook et al., 2015; Del Rio & Mayer, 2013; Dombrowski et al., 2015; Krakower et al., 2014; Liu et al., 2008;

Philbin et al., 2016). Providers' decisions to engage in the care continuum can be haphazard and often at their own discretion (Herschell, Kolko, Baumann, & Davis, 2010). Nonetheless, IPC's direct positive effect on all three service outcomes suggest that providers may benefit from IPC training in order to develop positive attitudes about and linkage-making behaviors. Our findings show that after adjusting for IPC, recent in-agency linkage training was significantly associated with higher care continuum engagement. Adult Learning and Cognitive Behavioral theories suggest that on-the-job training can help to build provider knowledge and self-efficacy, and may thus help optimize linkage-making (Rotheram-Borus, Swendeman, & Chovnick, 2009; UNAIDS, 2014). Therefore, our findings add empirical support for training adult learners in specific tasks, such as linkage-making. Future research is recommended to examine if IPC and linkage training may help mitigate fear of losing patients.

Limitations

This study is limited by self-reported data and its cross-sectional design. Future research should use longitudinal data to highlight the long-term impact of linkage training and IPC in provider engagement in the care continuum. We were unable to use longitudinal data because we did not collect PrEP-related questions until after the baseline had been completed. Future research should also include qualitative methods to help explain the specific contributions of IPC domains and to clarify best timing, intensity and content of in-agency linkage trainings so as to influence consistent and systematic linkage-making. Our data are limited in terms of how we measured agency size and capacity, and frequency of linkages. Future research using more comprehensive measures of agency readiness may uncover specific agency-level factors that may facilitate and/or hinder care continuum engagement. The questions used to measure frequency of linkages assumes patient access to HIV testing and/or HIV primary care, but there is no patient confirmation. Self-reported main outcomes, based on six month recall, may influence accuracy. Nonetheless, both recall and accuracy were helped by the fact that most providers (nearly 90%) track these linkages thorough tracking systems. Lastly, linkage training was measured by self-report. Though not available to the team, administrative records would have been more accurate.

Conclusion

The Joint United Nations Programme on HIV/AIDS has a target to end the AIDS epidemic by 2020 – 90% of all individuals with HIV will be aware of their status; 90% with HIV infection will receive antiretroviral therapy; and 90% will receive ART and achieve viral suppression. [44] To achieve these goals, the field must ensure success of the care continuum. Access and retention of patients can be improved by providers in primary care, outpatient, and prevention settings. Linkage-making and PrEP psychoeducation are widespread practices in agencies offering HIV prevention and support services to vulnerable populations. [23] Our findings show that providers with higher IPC scores, and those with recent on-the-job training engage in higher rates of linkages to HIV testing and HIV primary care, and in more frequent PrEP psychoeducation. These findings show that IPC and linkage training can improve the initial steps of the care continuum, and suggest that it may also improve the other steps. To capitalize on these findings, we recommend resources and policies to increase attention to periodic training in both IPC and linkage-making. Further,

we recommend a renewed effort to inspire providers to engage with the HIV Continuum of Care at the consistent elevated level to end the epidemic. The demographic diversity of providers and agency characteristics in Project ICI makes us confident these results will have similar implications for other urban diffusion systems.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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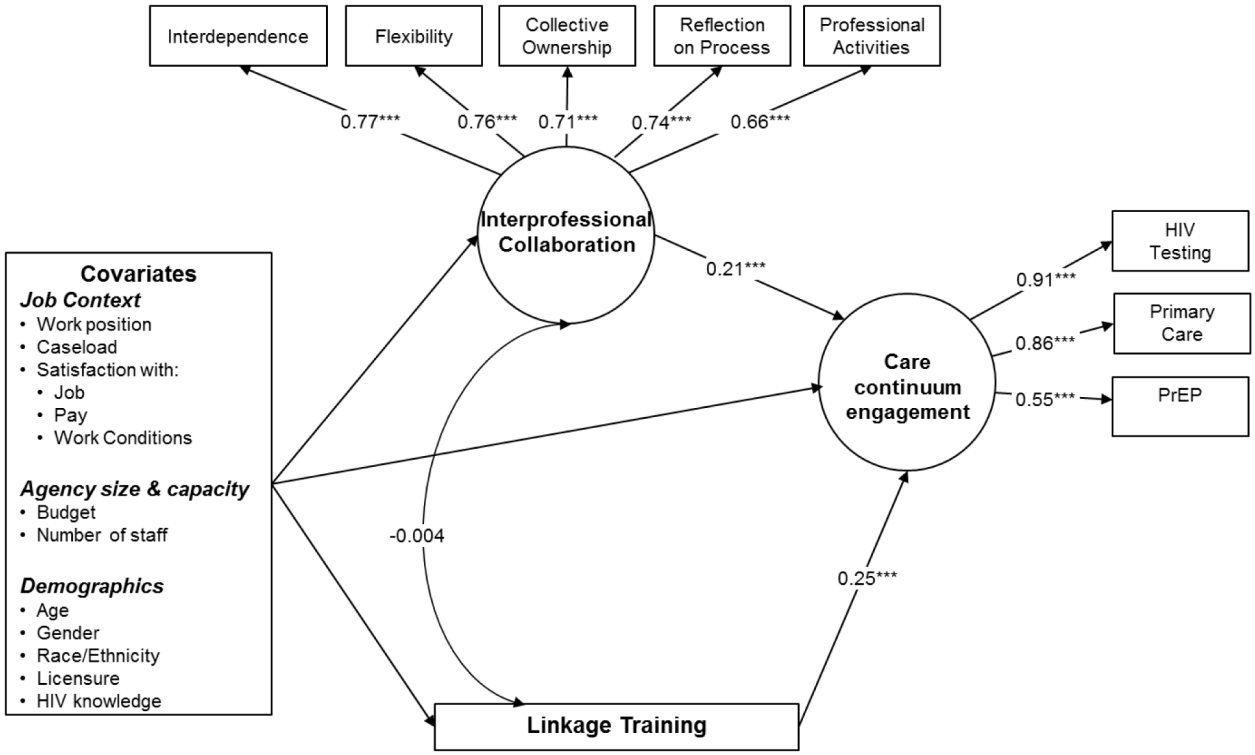

*** p<.001, ** p<.01, *p<.05

Figure 1.
Structural Equation Model with Standardized Estimates

Table 1:

Sample Demographic and Work Position Characteristics (N = 285)

Characteristic	n	%
Age (Mean= 42.5, SD=11.8)		
Gender		
Male	105	36.8
Female	180	63.2
Ethnicity		
Hispanic or Latino	185	64.9
Not Hispanic or Latino	100	35.1
Race		
More than one race	44	15.4
White	73	25.6
Black or African American	153	53.7
Native Hawaiian, Asian, American Indian, Alaskan Native	15	5.3
Highest level of education		
Less than high school	3	1.1
High school diploma/GED	66	23.2
Associate's Degree	28	9.8
Bachelor's Degree	90	31.6
Master's Degree	96	33.7
Doctoral Degree	2	0.7
Professional licensure		
At least one	123	43.2
None	162	56.8
Work Position		
Supervisor/Program Administrator	108	37.9
Direct Service Providers	177	62.1
Curriculum-based HIV Knowledge		
Yes	175	61.4
No	110	38.6